J. Environ. Nanotechnol.
Volume 8, No.2(2019) pp.33 36
ISSN (Print): 2279-0748
ISSN (Online): 2319-5541
doi:10.13074/jent.2019.06.192365

Preparation and Characterization of Activated Carbon Prepared from *Polyathia Longifolia* Seed Waste through Various Activation Processes

G. Bhuvaneswari[1], C. Amudha[2*], S. Srimathi[3]

[1,*2,3]*Department of Chemistry, Erode Arts and Science College (Autonomous), Erode, TN, India.*

Received: 18.10.2018 *Accepted: 12.12.2018*

Abstract

Activated carbon prepared from polyalthialongifolia seed by various chemical processes shows excellent improvement in the surface characteristics. Surface morphology also plays a significant role in the adsorption Properties along with surface functional groups. Activated carbon microspores, mesopores and macrospores. The volume of these pones varies depending upon the activating agents used during various processes, used. The morphology of the resulting sample was studied by scanning electron microscopy and the surface functional group was investigated by infrared spectroscopy techniques, physico-chemical characteristics such as bulk density, moisture content, ash content, matter soluble in water, soluble in acid, P^H iodine number, conductivity, porosity, yield percentage and surface area have been carried out to assess the suitability of the carbon as adsorbent, results of this investigation indicate that the activated carbon prepared using polyalthialongifolia by H_2So_4 impregnation process followed by activation at 110^{o}C and yield activated carbon with the highest surface area and more developed micro, me so, macro porosity.

Keywords : *Polyalthialongifolia, Activated carbon; carbonization, SEM,XRD,IR.*

1. INTRODUCTION

Activated carbons having high surface areas are extremely **ve**rsatile adsorbents of major industrial significance[1] .These are used in wide range of applications connected principally with the removal of species by adsorption from the liquid or gas phase[2]. Activated carbons can be produced from a number of precursor materials including wood, agricultural wastes and coal.[3] Carbons are activated different physical or chemical process [4].These precursors are normally exposed to effort achieve carbon with the high adsorption capacity for a particular application for the past few decades ,attention has been shifted towards adsorption technique [5].Adsorption as one of the widely accepted methods for the removal contain from waste water .Using activated carbon adsorption method is cost effectiveness.[6] Researchers in the recent past have mainly focused on the preparation of the activated carbon from polyalthiya longifoliya tree seed waste.[7] Activated carbon consequently numerous low cost alternatives have been proposed including sago waste and etc.[8] Prepared activated carbon characterizied by SEM,XRD ,IR .Then poly althiya longifoliya seed waste activated carbon tested with antimicrobial activity.

2. PREPARATION OF ACTIVATED CARBON

Activated carbon was prepared from ASOKA TREE SEED waste from asoka tree collected which was locally procured at ERODE ARTS C0LLEGE,ERODE.The material was treated with and dried in sun light.

The activated carbon was prepared from the above material Impregnated with concentrated H_2SO_4 and carbonized at 110 ° C for impregnated ratio of acid volume to weight of plant material 1:1(w/v) was employed.Before utilization the carbon was washed with distilled water and dried in a hot air oven at 100± 5°C,Finally it was ground and sieved.

C. Amudha
email:

3. ACTIVATED CARBON PREPARED FROM PALS WASTE BY DIFFERENT ACTIVATION PROCESS

Sample	Treatment process
BAC1	H2SO4 Process +Thermal Activation under N2 flow
BAC2	H3PO4 Process +Thermal Activation under N2 flow
BAC3	Na2CO3 Process +Thermal Activation under N2 flow
BAC4	CaCO3 Process +Thermal Activation under N2 flow
BAC5	Na2SO4 Process +Thermal Activation under N2 flow

4. CHARTERISATION STUDIES OF ACTIVATED CARBON

4.1 Sem Analysis

Scanning electron microscopy (SEM) has been primary tool for characterizing the surface morphology and fundamental physical properties of the adsorbents surface .It is useful for determining the particle shape ,porosity appropriate size distribution of the adsorbent Scanning electron micrographs of raw PALS are shown in fig(1) .From fig(1) it is clear that PALS has considerable numbers of pores.So there is good possibility for dyes to be trapped and adsorbed into these pores .The SEM of PALS sample shows that very distinguished dark spots Which can be taken as sign for effective adsorption of dye molecules in the cavities and pores of this adsorbent.

4.2 Studies for SEM

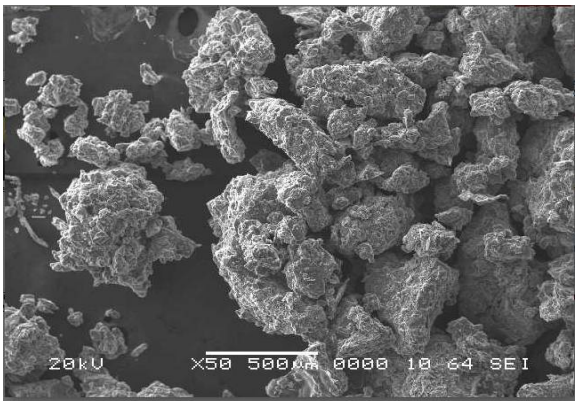

Fig. 1: SEM for polyalthiya longifoliya carbon

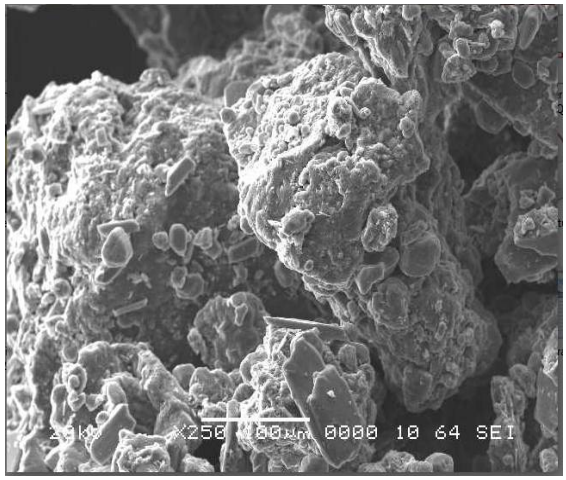

Fig. 2: SEM for polyalthiya longifoliya carbon

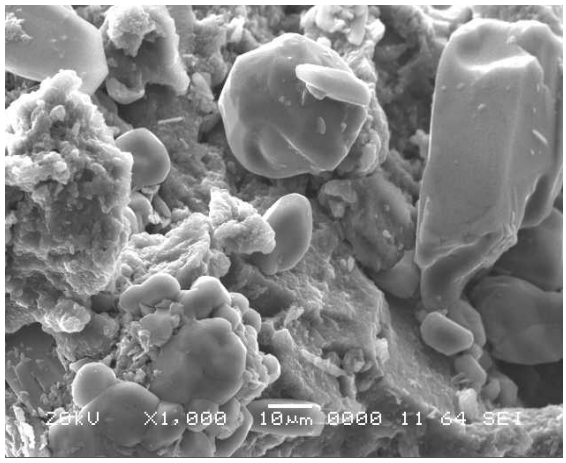

Fig.3 : SEM for polyalthiya longifoliya carbon

5. pH and CONDUCTIVITY

1 g of the carbon in 200 ml of distilled water was equilibrated by agitating at 165 rpm for 1 hr and filtered using whatmann filter paper . pH and conductivity of supernatant solution was checked by using pH meter and conductivity meter respectively .

pH carbon =**2.69**

5.1 Moisture Content

1 g of carbon was placed in a china dish and heated in oven at 110 ºC for 1 hr, after heating , the china dish was cooled in a dessicator and then weighed . Heating cooling and weighing was repeated at 30 min intervals until the difference between the two consecutive weight was less then 1 mg. the loss in weight gives the moisture content.

$$\text{Moisture content (\%) by mass} = \frac{M-x}{M} \times 100$$

Where

M = Mass of the material taken for test (g)

X= Mass of the material after drying (g).

Moisture content carbon = **42.89**

5.2 Ash Content

About 1 g of carbon was weighed accurately in a silica crucible and placed in an electric furnace at 180 ºC about 1 hr. The crucible was removed from the electric furnace after heating, the crucible was cooled in a dessicator and then weighed. The process of heating and cooling was repeated until the difference between two consecutive weight was less then 1mg.

$$\text{Ash (on dry basis) \% by mass} = \frac{M1}{M2-X} \times 100$$

Where

M1 mass of the ash (g)

M2 = Mass of the material taken for test (g)

X= percent moisture content present in the material taken for test.

ASH Content carbon = **36.86**

5.3 Matter Soluble In Water

5g of the carbon material of known moisture content was weighed accurately and transferred to a 1 liter beaker .About 300 ml of distilled water was added and heated to boiling with continuous stirring. Stirring was continued for 5 min after the flame was removed. The material was then allowed to settle. The supernatant was filtrate through crucible fitted with an asbestos mat. The procedure was repeated thrice with the residue in the beaker using 300 ml of water each time the combined liquid was concentrated to less then 100 ml over a water bath, cooled and made up to 100 ml mark in a volumetric flask. Exactly 50 ml of the concentrate was transferred to china dish and evaporated to almost dryness on boiling water bath and finally dried in an electric oven , maintained at 100 ± 5 ºC cooled in a dessicator and weighed. The procedure of drying and weighing was repeated at 30 min intervals, until the difference between the two consecutive was less then 5 gm.

$$\text{Matter soluble in water(\%)} = \frac{M1}{M2-X} \times 100$$

M1 = Mass of the residue (g)

M2 = Mass of the material taken for test (g)

X = Percent of moisture present in the material

6. METHODS

6.1 Antimicrobial Activity of Polyalthialongifoliya

The multidrug resistant pathogens Escherichia coli, Staphylococcus aureus was procured from KMCH Laboratories, KMCH hospitals, Coimbatore ,Tamilnadu. The optimal 24 hours broth cultures of Escherichia coli and Staphylococcus aureus was used for antimicrobial activity. The circularly cutted filter paper soaked in the mixture of powdered Polyalthialongifolia which are soaked in con.H_2SO_4 at various concentrations (0.1 – 0.5%) was added into the plates in and incubated at 37°C for 24 hours. The powdered Polyalthialongifolia samples that found effective, as antimicrobial agent during qualitative test were tested to determine the minimum inhibitory concentration (MIC) and minimum bactericidal concentration (MBC) values for each strain. MIC was determined by broth dilution method. About 100 µl of 10^5 CFU/ml of the test culture was inoculated in tubes with equal volume of nutrient broth and powdered Polyalthialongifoliasamples. The tubes were incubated aerobically at 37°C for 24h. Two control tubes were maintained for each strain (media control and organism control). The dilutions that showed no turbidity were incubated further for 24h at 37°C. The lowest concentration that produced no visible turbidity after a total incubation period of 48h was regarded as final MIC. MBC value was determined by sub culturing the test dilution [which showed no visible turbidity] on to freshly prepared nutrient agar media. The plates were incubated further for 24-48h at 37°C. The highest dilution that yielded no single bacterial colony on the nutrient agar plates was taken as MBC.

6.2 Result & Observation

The antimicrobial activity between the powdered Polyalthialongifolia were done. The powdered Polyalthialongifolia produced by the soaking them in con.H_2SO_4 were showed most sensitivity against both **E.coli** and **Staphylococcus aureus** from on 20µl, he powdered Polyalthialongifolia in 10µlshowed least amount of sensitivity against both multi drug resistant microorganisms.

Fig -(1)

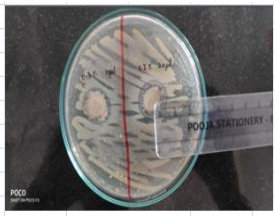

Fig -(2)

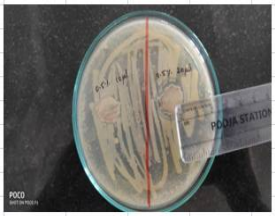

Fig -(3)

Fig -(4)

7. CONCLUSION

Activated carbon with moderate surface area obtained from Polyalthialongifolia seed waste . The difference in textual characteristics related to the activation process the surface area of prepared activated carbon was increased by treating with con H_2SO_4. SEM studies revealed that the spherical shaped nano particals were in the range 55-8nm

Activated carbon prepared from above process used both organic and inorganic effluent removal. The synthesized Polyalthialongifolia seed extract in activated carbon proved outstanding antimicrobial activity the efficiency against multi drug resistant clinical isolates .It was wall established by the clear zone of inhibition against antimicrobial activity.

The prepared activated carbon seed waste was tested against bacteria like E-Coli and staphylococcus aureus.

The normal biological approach for antimicrobial activity using Polyalthialongifolia carbon eco- friendly and conventional method, when compared to the physico-chemical synthesis.

REFERENCES

Bhattacharya, D. and Gupta, R., Crit, Rev. Biotechnol., **25**(2005) 199.

Cueny, B. R., Thin solid films(2010)3127.

Davis, R., Holt, E., RinehartWinston**24**(2006).

Ho, Y. S. and John, D. A., Waste and C.F.Forester, Water Res.,**29** (5),1327(1995).

Hunt, J. A., Sykes, A., Manson, J. P., Longman**35**,(1987).

John, J., Alexander & Margart, J., Steffel Hutchings.(1976).

Khattri, S. D., Singh, M. K., J.chem.Technol.,**6**,116(1999).

Martin, J. B.,(USEPA)FederalRegistar,**77**,58(2012).

Ozaear, M. and Sengil, I., Bioresource Technol.**96**.,791(2005).

Pasto, Johnson&Miller, PrenticeHall(1992).

Shaverdi, A. R., Fakhmi, A., Shahverdi, H. R. and Minian, S., Nanomedicine, 36(2000)Res35(1987).

Sondi, I., Salope Sondi, B., J.Colloid Interface Sci.**275**(2005)182.

Stone, R. H. and Tripp,W. H., Routledge and Kegan Paul (1981).

Summerlin, L. R. and Ealy, J. L., Jr, American Chemical society (1988).

Zawndski, J., Carbon,**19(**1981**).**